

# REVISED SPECIFICATION

## BACKGROUND OF THE INVENTION

The present invention relates to a transfer device with a cylinder for reversibly moving an object in horizontal or inclined translation over a travel distance substantially twice as large as that of said cylinder.

5           There are already known lifting devices with a cylinder, used on lifting trucks, which comprise cable elements such as chains, passing over a pulley arranged at the end of the rod of a cylinder, and which allows, while being driven by the latter, the vertical movement of gripping means such as a fork over a travel distance twice as long as that of said cylinder. These lifting devices can however not be used for a horizontal  
10 translation or according to a certain inclination, since only one driving direction is foreseen, the lowering being achieved by gravity.

The invention also relates to a particular application of the transfer device according to the invention in the field of the transport vehicles with a moving platform, of the type including a chassis provided with a platform capable of sliding and tilting to  
15 adopt two extreme positions, one [unfolded] extended and lowered to the ground allowing [proceeding to] loading of an object such as [or an immobilised] a disabled vehicle, and the other [one] raised with respect to [said] the chassis, for transportation.

In fact, as is known, such a platform is mounted movable in translation onto a ramp the chassis is provided with and which is, in turn, capable of tilting with respect  
20 to the latter, like a tub, to pass over from a horizontal position, parallel to said chassis, into an inclined position.

Thus, to load a [craft immobilised] disabled vehicle on the ground onto a [vehicle] platform of this type, the operator first proceeds to tilt[ing] the ramp with respect to the towing chassis, before bringing the platform near to the ground, [through

sliding along the ramp]. The disabled [object or immobilised object] vehicle to be loaded is then pulled onto the platform, and is then moved forwardly [the latter is brought back to the chasses through sliding in the opposite direction] along the ramp, which is then tilted in the opposite direction, to be retracted to [restored into] its initial  
5 position, parallel to the chassis.

One will easily understand that, in order to ease [make easy the] loading [namely depending on the nature of the object or of the vehicle to be loaded] (given, e.g. [with] a large overhang and/or a small ground clearance), the platform preferably should [must, on the one hand,] rest on the ground [and on the other hand] or form,  
10 with respect to the ground [latter], an angle as small as possible.

Most devices for controlling the moving of such a platform also [comprise means that also] allow the platform [latter] to perform, after sliding of the disabled vehicle along the ramp, a slight pivoting motion that allows [reducing] the reduction of this “loading angle”.

15 Thus, from FR 2 686 843 is known a device that discloses [mainly includes means defining] a driving connection for causing a platform to slide and pivot with respect to a ramp and means capable of hinging said pivoting ramp with respect to said towing chassis at a location that allows making use of a rear overhang.

FR 2 682 336 [also] discloses a smaller [another] device [of the same type] in  
20 which a worm driven [by driving means allows achieving the moving a] platform is moved with respect to a tilting chassis using[through] a carriage fixed to the chain, movable in translation along the [said] tilting chassis. [and provided with] A fastening means [that] allows [connecting it in a hinging way] its hinged connection to the end of the platform.

These devices are, however, not fully satisfactory because of the complexity of their structure, which not only weakens them and can quickly give rise to malfunctions [dysfunction], but which, in addition, tend to substantially increase the cost of the trucks provided with them.

## 5 SUMMARY OF THE INVENTION

The aim of the present invention is to provide a transfer device with a cylinder of a simple design, which is reliable and inexpensive, and capable of being used for moving a platform with respect to a ramp.

The transfer device uses [with] a cylinder for reversibly moving an object in  
10 horizontal or inclined translation over a travel distance substantially twice as large as that of the [said] cylinder. [according to the invention is mainly characterised in that it includes] In a preferred embodiment, a double-acting cylinder the rod of which includes, at its end, means for returning by 180° on which symmetrically pass at least two cable elements, one for [the] extension and [another] one for retraction [the  
15 restoring], the latter being made integral by one end with the support of the [said] cylinder and by the other end with the [said] object, so that [the outward movement of said] extension of the cylinder rod causes the [said] object to move in the same direction through the extending cable [element], and also drives the retracting [said restoring] cable [element], while [the inward movement of said] cylinder rod retraction  
20 causes the [said] object to move in the opposite direction through the retracting [said restoring] cable [element] and also drives the [said] extending cable [element].

By selecting the locations at which the ends of the cables [elements] are secured to the object and to the support of the cylinder, a travel distance of the object twice as large as that of the cylinder length can be achieved in a way similar to the

known effect used for a lifting truck and, according to the invention, the inward movement of the rod of the cylinder allows restoring the object through the restoring cable [element].

According to a preferred embodiment of the device according to the invention,  
5 the cable elements consist of chains, whereas the returning means consist of pulleys mounted on a shaft arranged transversally to the end of the rod of the cylinder.

According to another preferred embodiment [additional feature] of the [device according to the] invention, the shaft arranged transversally to the end of the rod of the cylinder is pivotally mounted on a movable bearing block slidably connected to the  
10 object.

Also according to the invention, the support consists of a ramp capable of tilting on the chassis of a vehicle through pivoting according to a transversal axis, whereas the object to be moved consists of a platform capable of sliding along the [said] ramp.

15 According to another preferred embodiment [additional feature] of the [device according to the] invention, the platform is slidably mounted on the ramp through at least one sliding block capable of sliding along the [said] ramp and to which the outermost front portion of the [said] platform is connected using [by means of ] a pivot with a transversal axis.

## 20 BRIEF DESCRIPTION OF THE DRAWINGS

The advantages and the features of the device according to the invention will become clear when reading the following description, with reference to the attached drawings, which shows one non-restrictive embodiment.

In the attached drawings:

FIGURES [figures] 1a, 1b and 1c show partial schematic views of a portion of the vehicle bed and loading ramp, with the loading ramp being slid relative to the vehicle bed via [the transfer device with] a cylinder [according to the invention] shown at various stages of its operation;

5        FIGURE [figure] 2 shows a schematic side view of a vehicle recovery unit provided with the [such a] device of FIGURE 1; and

FIGURE 3 shows a partial schematic view of a portion of this device.

### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

[When] Referring first to Figure 1a, [which shows the] a [transfer] device is  
10    shown with a cylinder [according to the invention] in resting position. [one can see that the latter comprises] The cylinder preferably is a double-acting cylinder 1 borne by a support 2 and aimed at causing an object 3 such as a loading ramp to move.

Loading ramp [The object] 3 is slidably mounted, parallel to a [the] support such as a vehicle bed 2, directly on the latter or through means that are not shown.

15        The cylinder 1 includes a body 10 and a rod 11, the latter being provided, at its free end, with two pulleys or the like 12, only one of which can be seen in the figure, which are freely rotationally mounted according to a transversal axis.

Furthermore, the device includes [comprises] two cable elements 4 and 5, such as chains, made integral with both the support 2 and the object 3, and each passing over  
20    a pulley 12, to be returned by 180°.

Thus, the cable element 4, the so-called extending cable element, includes an end 40 made integral with the support 2 in the vicinity of the front end 13 of the body 10. [whereas its] The other end 41 is made integral with the object 3 at some distance from the front end 13; [,] in the embodiment shown in the drawings, [this case] in the

resting position, end 41 is located at or about in front of the rear end 14 of the body 10, so that the cable element extends along the body 10 and the object 3 over a length substantially equal to that of the body 10.

Likewise, [the] cable element 5, the so-called retracting [restoring] cable  
5 element, includes an end 50 made integral with the support 2 at a location separated from the location of fastening of the end 40, whereas its other end 51 is made integral with the object 3 at a location separated from the location of fastening of the end 41, [in this case] In the embodiment shown in the drawings when in resting position, end 51 is at the level of the pulleys 12.

10 [When] Referring now to F[f]igures 1b and 1c, [one can see that] under the action of the outward movement of [the] rod 12 the cable element 4, having [due to the immobilization of its] fixed end 40, slides on its pulley 12 and causes the object 3 to move, while [the latter] drives the end 51 of the cable element 5, which slides on its pulley 12.

15 When [the] rod 11 is [has] fully extended [moved out], as shown appears in F[f]igure 1c, [it can be seen that the] object 3 has travelled a distance twice as large as the travel distance of [the] cylinder 1.

One understands that retraction [the inward movement] of [the] rod 11 results in[to] pulling on [the] cable element 5[,] which, because [of its] end 50 is fastened to  
20 [the] support 2, causes the object such as platform 3 to move towards its resting position and, simultaneously, [the] cable element 4.

The cylinder 1 can thus cause an object to reversibly move horizontally, or according to a certain inclination, over a length reaching up to twice its travel distance.

One understands that for balance reasons, the cable elements 4 and 5 are preferably double and arranged symmetrically to the longitudinal axis of the aggregate.

The device according to the invention is particularly advantageous for transport vehicles with a moving platform, such as the one shown in FIGURE [figure]

5 2.

In the preferred embodiment shown in the drawings, [This] vehicle 6 includes a support 2 that consists of a ramp, whereas the object 3 consists of a platform. The platform 3 is capable of sliding on the ramp 2 under the action of a cylinder 1 integral with the ramp 2, and through extending 4 and retracting [restoring] chains or cables 5.

10 Advantageously, but not necessarily [essentially], the end of [the] rod 11 of [the] cylinder 1 is connected, slidably in the longitudinal direction, to [the] platform 3, through a movable bearing block 7 that, in turn, bears the pulleys 12 through a shaft, not visible. The movable bearing block 7 thus allows the support[ing] of the end of [the] rod 11 of [the] cylinder 1.

15 [Furthermore, the] Ramp [ramp] 2 is pivotally connected [in a hinging way] to [the] chassis 60 of [the] vehicle 6, on a cross shaft 61 arranged at the rear end of [the] chassis 60, so that, under the action of [a] cylinder 62, [the] ramp 2 can tilt and its outermost rear cantilever portion 20 is lowered.

20 As can be seen in F[figure] 3, [the] platform 3 is connected to [the] ramp 2 through side sliding blocks 8, only one of which can be[e] seen, each capable of sliding on an edge of [the] ramp 2, and each bearing a pivot 80 with a transversal axis allowing pivotal connection [connecting the] with platform 3 at its front end [the level of the front end 30 of the latter, the front end 30 being the one opposite the rear end aimed at resting on the ground].

The sliding blocks 8 [allow ensuring the guiding of the] guide platform 3 during its sliding along [the] ramp 2 [, and the connection through the pivots]. Pivot connection 80 allows, during the lowering of the rear portion 20 of [the] ramp 2, reduction [reducing] in the angle formed by [the] platform 3 with respect to the ground.

5           The transfer device with a cylinder according to the invention, when used with [applied to] a transport vehicle with a moving platform, provides [the latter with] numerous advantages[,] compared to the existing similar vehicles[.]. A [the] primary advantage [one of which] is the simplicity of its design and, hence, of its manufacturing.

10           [The platform 3 can indeed be unfolded and brought back onto the vehicle 6 under the only action of the cylinder 1, and, secondarily of the cylinder 62, whereas the] Using the principles of the present invention, platform 3 may be rearwardly extended as shown in FIGURE 2, and then forwardly retracted onto ramp 2, using only cylinder 1, with cylinder 62 used to adjust the ramp level. The connection [through]  
15 using [the] sliding blocks 8 is a very simple design and [authorizes] permits [an important lowering of the] platform 3 to be lowered.

It is obvious that the present invention cannot be limited to the preceding description of one of its embodiments, which is likely to undergo some changes without therefore departing from the spirit of the invention.